

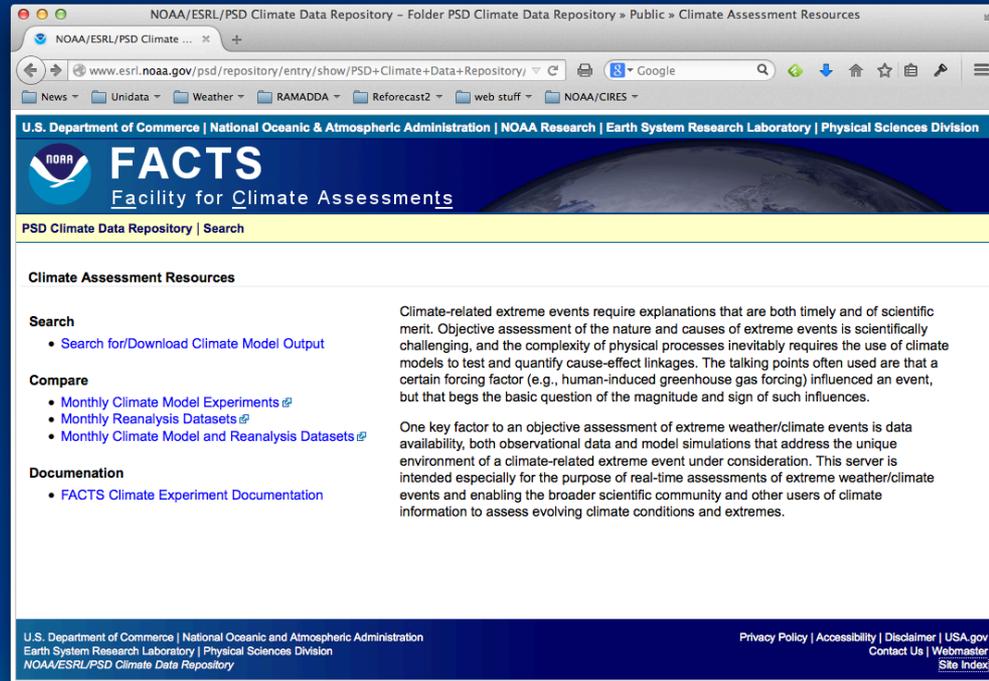
A Model Facility for Attribution Science

Don Murray
CU-CIRES and NOAA/ESRL/PSD

Co-conspirators: Marty Hoerling, Judith Perlwitz, Jon Eischeid, Xiao-wei Quan, Dave Allured, Taiyi Xu, Tao Zhang, Philip Pegion

Just the FACTS, Ma'am

- Facility for Climate AssessmentS (FACTS)
 - <http://www.esrl.noaa.gov/psd/repository/alias/facts>
- A new NOAA facility for assessment of recent weather and climate events
- Provides access to and analysis of climate model output
- Based on RAMADDA
 - Designed to be portable



The screenshot shows a web browser window displaying the NOAA/ESRL/PSD Climate Data Repository website. The page title is "NOAA/ESRL/PSD Climate Data Repository - Folder PSD Climate Data Repository » Public » Climate Assessment Resources". The browser address bar shows the URL "www.esrl.noaa.gov/psd/repository/entry/show/PSD+Climate+Data+Repository/". The page content includes the NOAA logo, the title "FACTS Facility for Climate Assessments", and a search bar. Below the search bar, there are sections for "Climate Assessment Resources", "Search", "Compare", and "Documentation". The "Search" section includes a link for "Search for/Download Climate Model Output". The "Compare" section includes links for "Monthly Climate Model Experiments", "Monthly Reanalysis Datasets", and "Monthly Climate Model and Reanalysis Datasets". The "Documentation" section includes a link for "FACTS Climate Experiment Documentation". A paragraph of text explains that climate-related extreme events require explanations that are both timely and of scientific merit, and that objective assessment of the nature and causes of extreme events is scientifically challenging. It also mentions that the server is intended especially for the purpose of real-time assessments of extreme weather/climate events and enabling the broader scientific community and other users of climate information to assess evolving climate conditions and extremes. The footer of the page includes the U.S. Department of Commerce | National Oceanic and Atmospheric Administration | Earth System Research Laboratory | Physical Sciences Division | NOAA/ESRL/PSD Climate Data Repository, along with links for Privacy Policy, Accessibility, Disclaimer, USA.gov, Contact Us, Webmaster, and Site Index.

Why do we need FACTS?

- Climate Model Intercomparison Projects (CMIP3 and CMIP5) provide a useful basis for studying how extremes change due to increasing greenhouse gases
- However, they are only of very limited usefulness to study the effects of real-time evolving modes of natural variability (e.g. ENSO, PDO, AMO) on observed weather/climate extremes.
- Scientists need to easily share and compare datasets.

Current FACTS Datasets

- AMIP experiments using CAM4 (.94 x 1.25 degree/L26) and ECHAM5 (T159/L31)
- 10-20 ensemble members for each experiment
- Experiments vary one or more of:
 - Greenhouse gases (GHG)
 - Sea Surface Temperature (SST)
 - Sea Ice (SIC)
 - Ozone (O3)
- All runs cover 1979-“present”

Input Forcing Sources

- Greenhouse Gases (GHG)
 - CMIP5 recommended values (Meinshausen, et al)
- SST and Sea Ice
 - Derived from CAM dataset (Hurrell, et al)
- Ozone
 - ECHAM5: Based on data from the AC&C/SPARC ozone database
 - CAM4: CAM-Chem (Lamarque, et al)
- Aerosols
 - Model dependent

Available Datasets

- PSD AMIP Experiments (monthly)
 - Observed Radiative Forcing (RF)
 - 1880s RF
 - Climatological Sea Ice & Polar SST
 - Climatological RF
 - Climatological Ozone
 - SST EOF 1
 - SST EOF 1&2

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NOAA/ESRL/PSD Climate ...

www.esrl.noaa.gov/psd/repository/entry/show/PSD

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PSD Climate Data Repository | Search

Climate Experiments

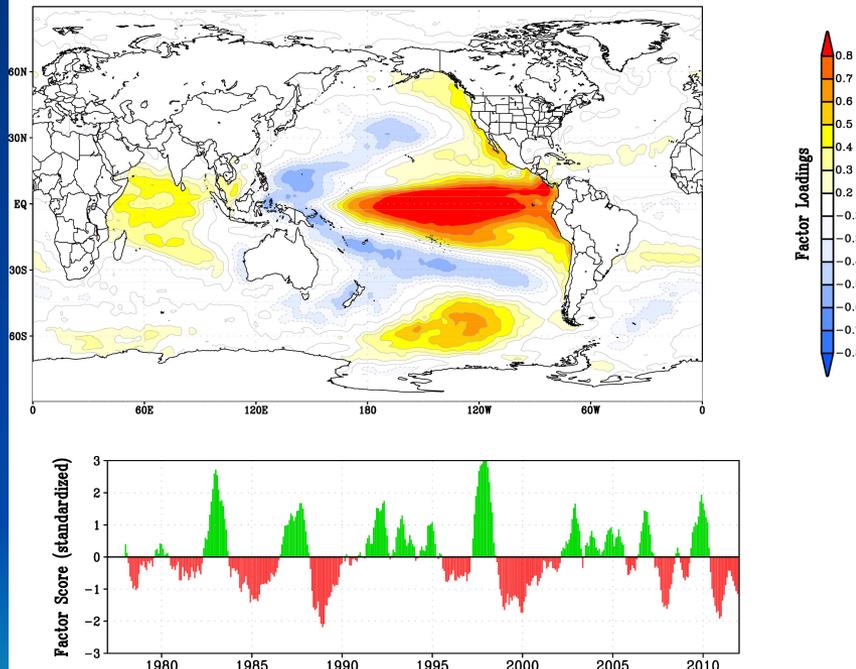
The table below shows the Climate Experiments that are being made available through the FACTS website. All runs cover the period 1979-2012 and will be extended as necessary (see footnotes).

Experiment Identifiers		Forcings ¹				Number of Ensemble Members	
Experiment Name ²	File Name ID ³	Sea Surface Temperature (SST)	Sea Ice	Greenhouse Gases (GHG)	Ozone	ECHAM5 ⁵	CAM4 ⁵
AMIP with Observed Radiative Forcing	amip_obs_rf	Obs	Obs	Obs	Obs	20	20 ⁶
AMIP with 1880s Radiative Forcing	amip_1880s_rf	Obs Detrended to 1880	Present Climatology	Past Climatology	Past Climatology	10	20
AMIP with Climatological Radiative Forcing	amip_clim_rf	Obs	Obs	Present Climatology	Present Climatology	10	
AMIP with Observed Radiative Forcing, Climatological Sea Ice and Polar SST	amip_clim_polar	Obs/Present Climatology	Present Climatology	Obs	Obs	10	20
AMIP with Observed Radiative Forcing, Climatological Ozone	amip_clim_o3	Obs	Obs	Obs	Present Climatology	10	
Leading Pattern of Global SST Variability⁴ with Observed Radiative Forcing	eof1_sst	1st EOF ⁴	Obs	Obs	Obs	10	
First 2 Leading Patterns of Global SST Variability⁴ with Observed Radiative Forcing	eof1+eof2_sst	1st & 2nd EOF ⁴	Obs	Obs	Obs	10	

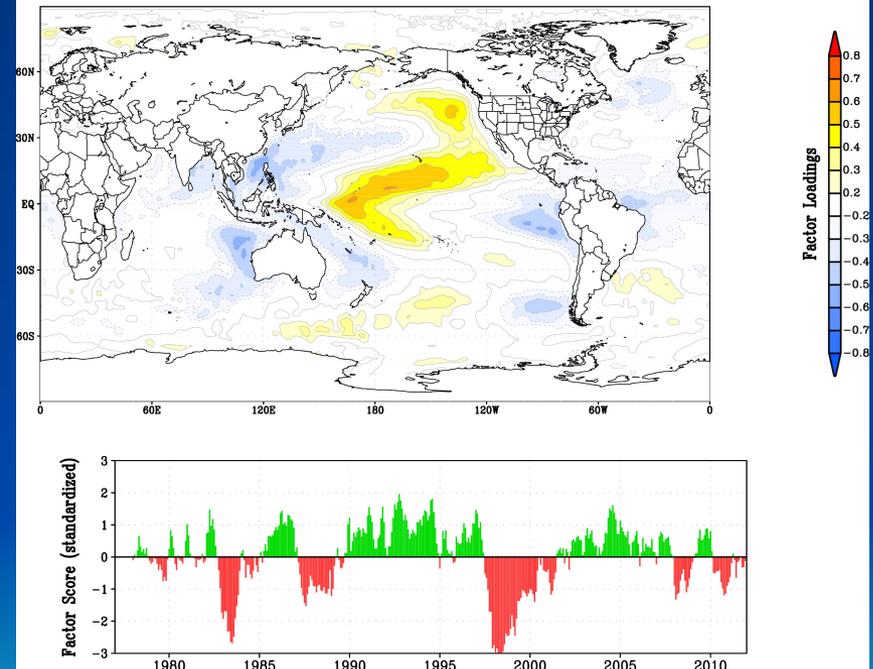
¹ Obs - Observed conditions, Present Climatology (varies by forcing, but generally some average conditions between 1981-2010), Past Climatology (1881-1910 climatology, or a specific pre-industrial date). See experiment descriptions for complete details.
² Text for "experiment" global attribute in files
³ Experiment identifier in file and directory names
⁴ Leading Patterns are the first and second Empirical Orthogonal Functions (EOF) of Global monthly SST variability 1979-2011 (EOF1, EOF2)
⁵ Model Resolution: ECHAM5 - 480x240 (.75°), CAM4 - 288x192 (-1°)
⁶ Updated through 2013

EOF Experiment Forcing

OISST-EOF 1: Global_dtr, lat wgt 18.4%
Cova Matrix, 1978-2011



OISST-EOF 2: Global_dtr, lat wgt 6.0%
Cova Matrix, 1978-2011



Available Datasets

- Reanalyses (monthly)
 - 20th Century V2
 - ERA-Interim
 - MERRA
 - NCAR/NCEP R1

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Climate Experiments

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AMIP with 1880s Radiative Forcing	amip_1880s_rf	Obs Detrended to 1880	Present Climatology	Past Climatology	Past Climatology	10	20
AMIP with Climatological Radiative Forcing	amip_clim_rf	Obs	Obs	Present Climatology	Present Climatology	10	
AMIP with Observed Radiative Forcing, Climatological Sea Ice and Polar SST	amip_clim_polar	Obs/Present Climatology	Present Climatology	Obs	Obs	10	20
AMIP with Observed Radiative Forcing, Climatological Ozone	amip_clim_o3	Obs	Obs	Obs	Present Climatology	10	
Leading Pattern of Global SST Variability⁴ with Observed Radiative Forcing	eof1_sst	1st EOF ⁴	Obs	Obs	Obs	10	
First 2 Leading Patterns of Global SST Variability⁴ with Observed Radiative Forcing	eof1+eof2_sst	1st & 2nd EOF ⁴	Obs	Obs	Obs	10	

¹ Obs - Observed conditions, Present Climatology (varies by forcing, but generally some average conditions between 1981-2010), Past Climatology (1881-1910 climatology, or a specific pre-industrial date). See experiment descriptions for complete details.
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⁶ Updated through 2013

Variables

- Surface:
 - Temperature (surface, 2m)
 - Precipitation (total, convective, large scale)
 - Pressure (surface, sea level)
 - Surface upward latent heat flux
- Pressure (17 levels)
 - Temperature
 - U&V Wind Components
 - Geopotential Height

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Climate Experiment Variables

The table below shows a list of variables being made available through the FACTS website. Each experiment may have only some of the variable available. The netCDF files use the CMIP5 variable names and units where possible and include variable attributes to show the original model variable name and units.

Variable Description (long_name attribute)	CMIP5 Variables and Units			Model Variables	
	Variable Name	Units	CF Standard name	ECHAM5	CAM4 ²
Total Cloud Fraction	clt	%	cloud_area_fraction	acloco	
Surface Upward Latent Heat Flux	hfls	W m-2	surface_upward_latent_heat_flux	ahfl	LHFLX
Surface Upward Sensible Heat Flux	hfss	W m-2	surface_upward_sensible_heat_flux	ahfs	
Convective Precipitation	prc	kg m-2 s-1	convective_precipitation_flux	aprc	PRECC
Large Scale Precipitation	prl ¹	kg m-2 s-1	large_scale_precipitation_flux	aprl	PRECL
Snowfall Flux	prsn	kg m-2 s-1	snowfall_flux	aprs	
Surface Air Pressure	ps	Pa	surface_air_pressure	aps	PS
Evaporation	evspsbl	kg m-2 s-1	water_evaporation_flux	evap	
Geopotential Height	zg	m	geopotential_height	geopoth	Z3
Omega	wap	Pa s-1	lagrangian_tendency_of_air_pressure	omega	
Precipitation	pr	kg m-2 s-1	precipitation_flux	precip	precip
Specific Humidity	hus	kg kg-1	specific_humidity	q	
Vertically Integrated Water Vapor	prw	kg m-2	atmospheric_water_vapor_content	qvi	
Relative Humidity	hur	%	relative_humidity	relhum	
Surface Runoff	runo	kg m-2 s-1	runoff_flux	runoff	
Sea Level Pressure	psl	Pa	air_pressure_at_sea_level	slp	PSL
Snow Depth	snd	m	surface_snow_thickness	sn	
Air Temperature	ta	K	air_temperature	st	T
Daily Maximum Near-Surface Air Temperature	tasmax	K	air_temperature	t2max	
Daily Minimum Near-Surface Air Temperature	tasmin	K	air_temperature	t2min	
Near-Surface Air Temperature	tas	K	air_temperature	temp2	TREFHT
Surface Temperature	ts	K	surface_temperature	tsurf	TS
Eastward Wind	ua	m s-1	eastward_wind	u	U
Eastward Near-Surface Wind	uas	m s-1	eastward_wind	u10	
Northward Wind	va	m s-1	northward_wind	v	V
Northward Near-Surface Wind	vas	m s-1	northward_wind	v10	
Surface Albedo	alb ¹	1	surface_albedo	albedo	
Near-Surface Dew Point Temperature	dtas ¹	K	dew_point_temperature	dew2	
Velocity Potential	velpot ¹	m2 s-1	atmosphere_horizontal_velocity_potential	velopot	
Streamfunction	stream ¹	m2 s-1	atmosphere_horizontal_streamfunction	stream	
WMO-defined Tropopause Pressure	trop ¹	Pa	N/A	tropo	

FACTS Website

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NOAA/ESRL/PSD Climate ... x +

www.esrl.noaa.gov/psd/repository/entry/show/PSD+Climate+Data+Repository/

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Climate Assessment Resources

Search

- [Search for/Download Climate Model Output](#)

Compare

- [Monthly Climate Model Experiments](#)
- [Monthly Reanalysis Datasets](#)
- [Monthly Climate Model and Reanalysis Datasets](#)

Documentation

- [FACTS Climate Experiment Documentation](#)

Climate-related extreme events require explanations that are both timely and of scientific merit. Objective assessment of the nature and causes of extreme events is scientifically challenging, and the complexity of physical processes inevitably requires the use of climate models to test and quantify cause-effect linkages. The talking points often used are that a certain forcing factor (e.g., human-induced greenhouse gas forcing) influenced an event, but that begs the basic question of the magnitude and sign of such influences.

One key factor to an objective assessment of extreme weather/climate events is data availability, both observational data and model simulations that address the unique environment of a climate-related extreme event under consideration. This server is intended especially for the purpose of real-time assessments of extreme weather/climate events and enabling the broader scientific community and other users of climate information to assess evolving climate conditions and extremes.

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Search for/Download Data

NOAA/ESRL/PSD Climate Data Repository – NOAA FACTS Climate Data Collection PSD Climate Data Repository » Public » Climate Assessment Resources » PSD Monthly Climate Model Runs

www.esrl.noaa.gov/psd/repository/entry/show/PSD+Climate+Data+Repository/Public/Climate+Assessment

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Facility for Climate Assessments

PSD Climate Data Repository | Search

PSD scientists run model simulations to compare the effects of various climate forcing signals on the atmosphere over time. This page allows you to download monthly output from some of those simulations. See the [documentation](#) pages for more information.

The boxes below allow you to refine a search for particular data available in this collection. Each box provides a list of all available selections for that option, so some combinations of selections will find no data. You can skip a particular box to search for all available data with that option. Refine your search using the boxes and use the **Search** button to search the database. If any data is found that matches your search, a list of available files will be displayed to the right of the boxes. Use the **Download Data** button to download any of the checked datasets in the list.

Send any questions or problems to [Don Murray \(don.murray@noaa.gov\)](mailto:don.murray@noaa.gov)

Select Data

Model:

Experiment:

Ensemble Member:

Variable:

7 files found

<input type="checkbox"/>	Collection ID	Model	Experiment	Ensemble Member	Variable	Size	
<input checked="" type="checkbox"/>	tas_ECHAM5_amip_1880s_rf_mean.nc	undefined	ECHAM5	amip_1880s_rf	mean	tas	98.65 Mb
<input checked="" type="checkbox"/>	tas_ECHAM5_amip_clim_rf_mean.nc	undefined	ECHAM5	amip_clim_rf	mean	tas	98.63 Mb
<input checked="" type="checkbox"/>	tas_ECHAM5_amip_clim_o3_mean.nc	undefined	ECHAM5	amip_clim_o3	mean	tas	98.63 Mb
<input checked="" type="checkbox"/>	tas_ECHAM5_eof1_sst_mean.nc	undefined	ECHAM5	eof1_sst	mean	tas	98.35 Mb
<input checked="" type="checkbox"/>	tas_ECHAM5_eof1+eof2_sst_mean.nc	undefined	ECHAM5	eof1+eof2_sst	mean	tas	98.36 Mb
<input checked="" type="checkbox"/>	tas_ECHAM5_amip_obs_rf_mean.nc	undefined	ECHAM5	amip_obs_rf	mean	tas	98.63 Mb
<input checked="" type="checkbox"/>	tas_ECHAM5_amip_clim_polar_mean.nc	undefined	ECHAM5	amip_clim_polar	mean	tas	98.59 Mb
	Collection ID	Model	Experiment	Ensemble Member	Variable	689.83 Mb	

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NOAA/ESRL/PSD Climate Data Repository

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Compare Models

- Interactive plotting – Monthly Data
 - Plot single model/experiment/ensemble member
 - Compare same model over different time periods
 - Compare two different model experiments
 - Compare model experiments and reanalyses
- Uses CDO and NCL for analysis and plotting

Compare Models

NOAA/ESRL/PSD Climate Data Repository - Climate Model Comparison

www.esrl.noaa.gov/psd/repository/model/compare?collection=dl

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PSD Climate Data Repository | Search

Climate Model Comparison

Plot monthly maps from different climate model datasets as well as differences between datasets.

Collection: PSD Monthly Climate Model Runs

Select Data To Plot Make Plot

Field(s)

Dataset 1	Dataset 2 (Optional)
Model: ECHAM5	Model: CAM4
Experiment: AMIP with Observed Radiative Fc	Experiment: AMIP with Observed Radiative Fc
Ensemble Member: Ensemble Mean	Ensemble Member: Ensemble Mean
Variable: Near-Surface Air Temperature	

Update Data Selection

Area Statistics

Variable: Near-Surface Air Temperature

Statistic: Average Anomaly

Months: Start: December End: February

Years: First Dataset: Start: 2000 End: 2012

Years: Second Dataset: Start: 2000 End: 2012

Region: Northern Hemisphere

Plot Options

Plot As: Difference Separate Plots

Plot Type: Map (Image) Google Earth

Plot Units: Kelvin Celsius

Override Contour Interval:

Defaults: Range: Low High

ECHAM5 amip_obs_rf ensmean tas anomaly Dec-Feb 2000-2012 minus CAM4 amip_obs_rf ensmean tas anomaly Dec-Feb 2000-2012

Near-Surface Air Temperature Anomaly K

Download image

Files used for plots:
ECHAM5 amip_obs_rf ensmean tas anomaly Dec-Feb 2000-2012
CAM4 amip_obs_rf ensmean tas anomaly Dec-Feb 2000-2012

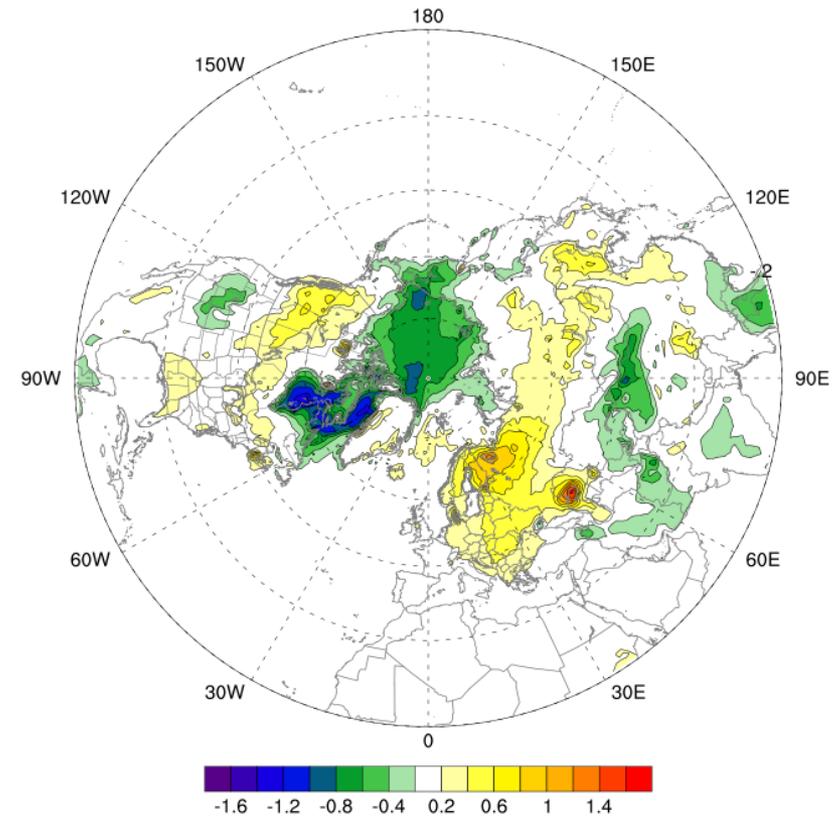
(Download All Files)

Plotted from NOAA/ESRL/PSD Climate Data Repository on 2014-07-23 21:10 UTC

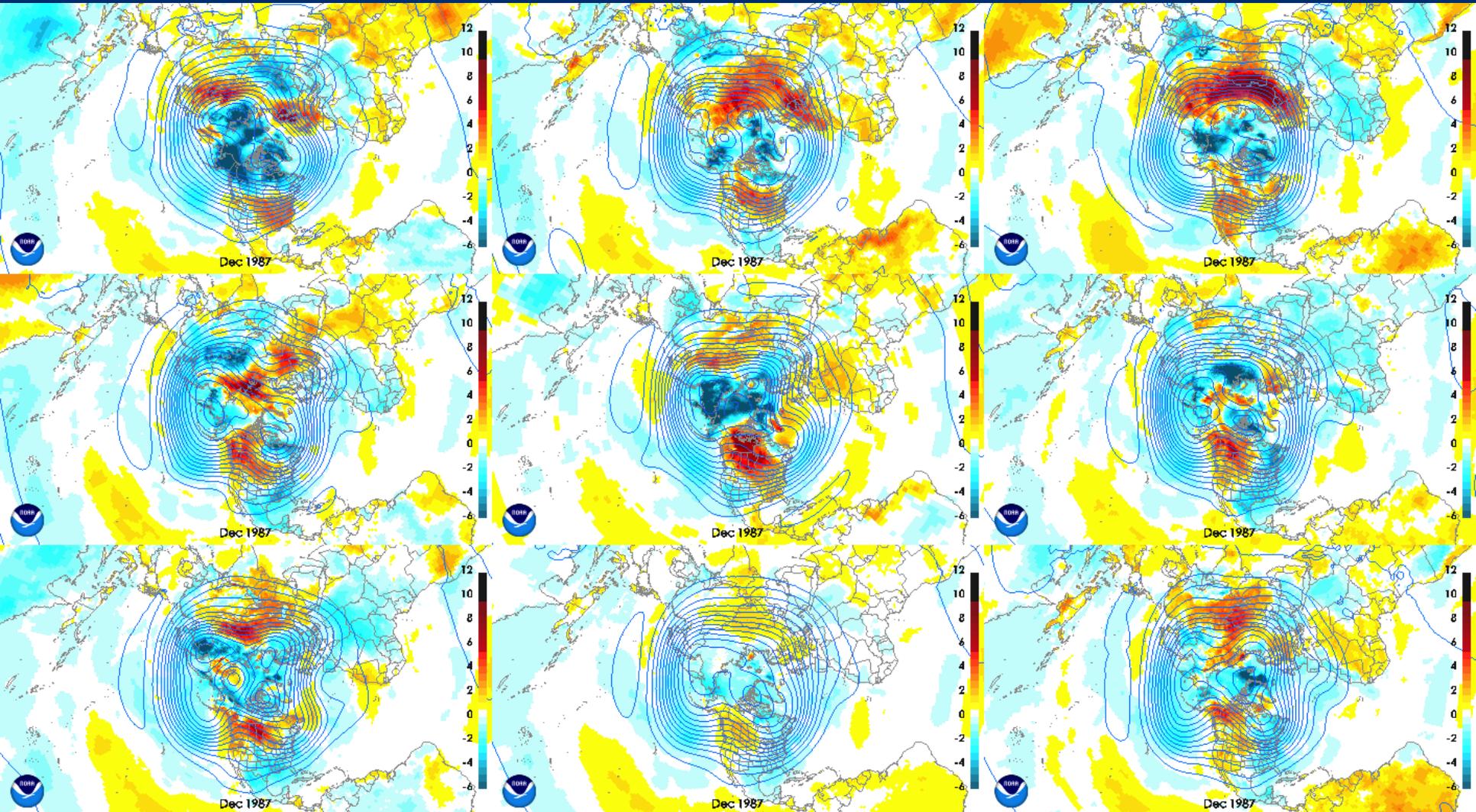
ECHAM5 amip_obs_rf ensmean tas anomaly Dec-Feb 2000-2012 minus CAM4 amip_obs_rf ensmean tas anomaly Dec-Feb 2000-2012

Near-Surface Air Temperature Anomaly

K



Examples



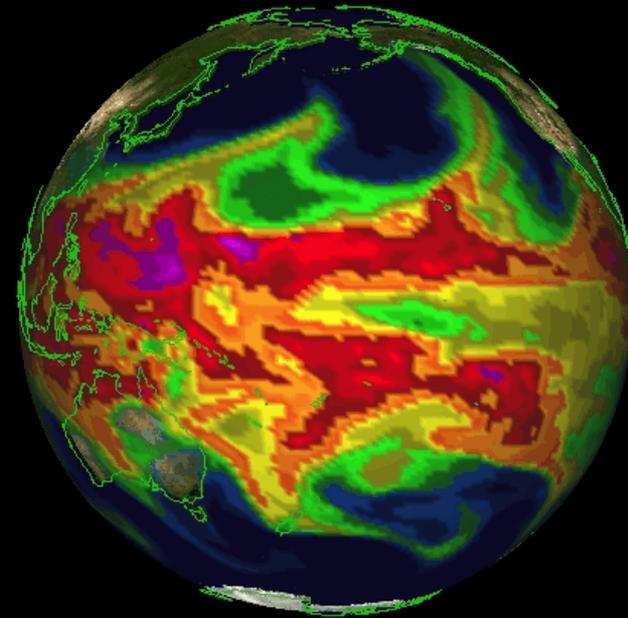
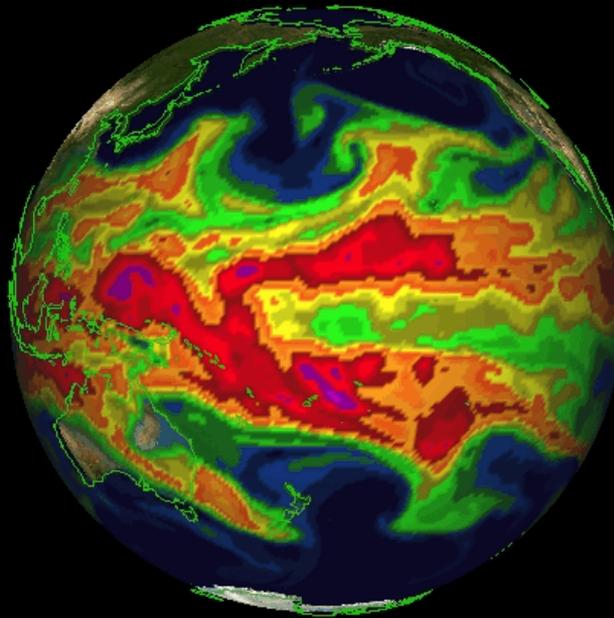
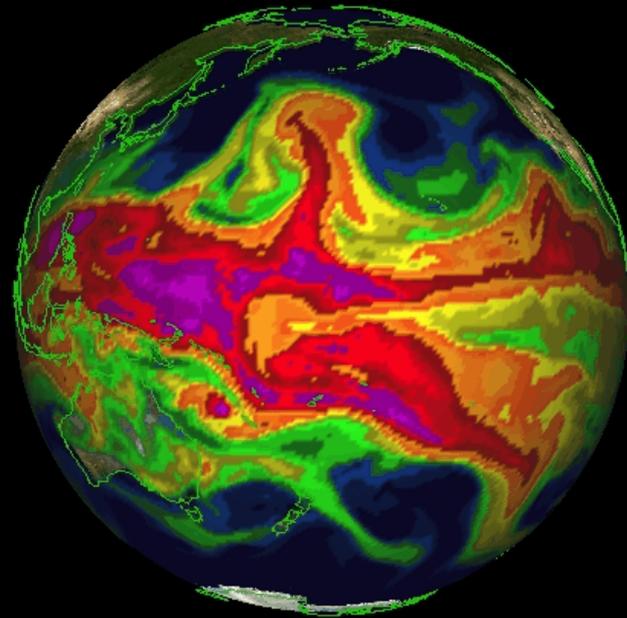
Attribution of Weather and Climate Extremes Workshop

2m Temperature anomalies and 500 hPa heights – 1981-1990

September 11, 2014



Examples



Which is Which?

Daily Precipitable Water for December

Attribution of Weather and Climate Extremes Workshop
September 9-11, 2014



FACTS Documentation

- **Experiments** page lists the experiments, the forcings used and the number of ensembles
 - Each experiment has a detailed page listing the input datasets used.
- **Variables** page shows the original model variable names
 - Files use CMIP5 variable names
- **File Format**
 - All files use CF Conventions
 - CMIP5-like naming
 - netCDF4 w/ compression

The screenshot shows a web browser window with the URL www.esrl.noaa.gov/psd/repository/entry/show/PSD+C. The page title is "AMIP with Observed Radiative Forcing, Climatological Sea Ice and Polar SST".

Description: AMIP conditions in which sea ice is set to a repeating seasonal cycle of 1979-1989 (pre-emergence of the melt out). SST is defined as described below.

Experiment ID: amip_clim_polar

Years: 1979-2012

Forcings

Sea Surface Temperature (SST)	<p>The SST in the polar regions are specified as follows:</p> <ul style="list-style-type: none">• For the grid points where the 1979-89 climatological sea-ice coverage of a month (e.g. January) is 100%, SST = -1.8 C• For the grid points where the 1979-89 climatological sea-ice coverage of a month is greater than 0, but less than 100%, SST is specified to the value of 1979-89 climatology of the respective month.• For the grid points where the 1979-89 climatological sea-ice coverage of a month is 0, SST is specified as observed monthly value of that particular year-month (e.g. January of 2013). <p>SST values are from the dataset described here:</p> <p>Hurrell, James W., James J. Hack, Dennis Shea, Julie M. Caron, James Rosinski, 2008: A New Sea Surface Temperature and Sea Ice Boundary Dataset for the Community Atmosphere Model. <i>J. Climate</i>, 21, 5145-5153. doi: 0.1175/2008JCLI2292.1</p>
Sea Ice (SIC)	<p>A repeating seasonal cycle of roughly 1979-1989 (pre-emergence of the melt out). Values are from the dataset described here:</p> <p>Hurrell, James W., James J. Hack, Dennis Shea, Julie M. Caron, James Rosinski, 2008: A New Sea Surface Temperature and Sea Ice Boundary Dataset for the Community Atmosphere Model. <i>J. Climate</i>, 21, 5145-5153. doi: 0.1175/2008JCLI2292.1</p>
Greenhouse Gases (GHG)	<p>Values from:</p> <p>Meinshausen, M., S. J. Smith, K. V. Calvin, J. S. Daniel, M. Kainuma, J.-F. Lamarque, K. Matsumoto, S. A. Montzka, S. C. B. Raper, K. Riahi, A. M. Thomson, G. J. M. Velders and D. van Vuuren (2011). The RCP Greenhouse Gas Concentrations and their Extension from 1765 to 2300. <i>Climatic Change (Special Issue)</i>. doi: 10.1007/s10584-011-0158-z</p> <p>which are the CMIP5 Recommendations for annual average, global mean concentrations.</p>
Ozone (O3)	<p>ECHAM5: Values from the AC&C/SPARC ozone database:</p> <p>Cionni, I., V. Eyring, J. F. Lamarque, W. J. Randel, D. S. Stevenson, F. Wu, G. E. Bodeker, T. G. Shepherd, D. T. Shindell, and D. W. Waugh, 2011: Ozone database in support of CMIP5 simulations: results and corresponding radiative forcing. <i>Atmos. Chem. Phys. Discuss.</i>, 11, 10875-10933, doi: 10.5194/acpd-11-10875-2011, 2011.</p> <p>CAM4: values from:</p> <p>Lamarque, J.-F., Emmons, L. K., Hess, P. G., Kinnison, D. E., Tames, S., Vitt, F., Heald, C. L., Holland, E. A., Igarashi, T., J. J. Orlando, J. J., Rasch, P. J., and Tyndall, G. K., 2012: CAM-chem: description and evaluation of interactive atmospheric chemistry in the Community Earth System Model. <i>Geosci. Model Dev.</i>, 5, 369-411, doi: 10.5194/gmd-5-369-2012, 2012.</p>

Examples of Usage

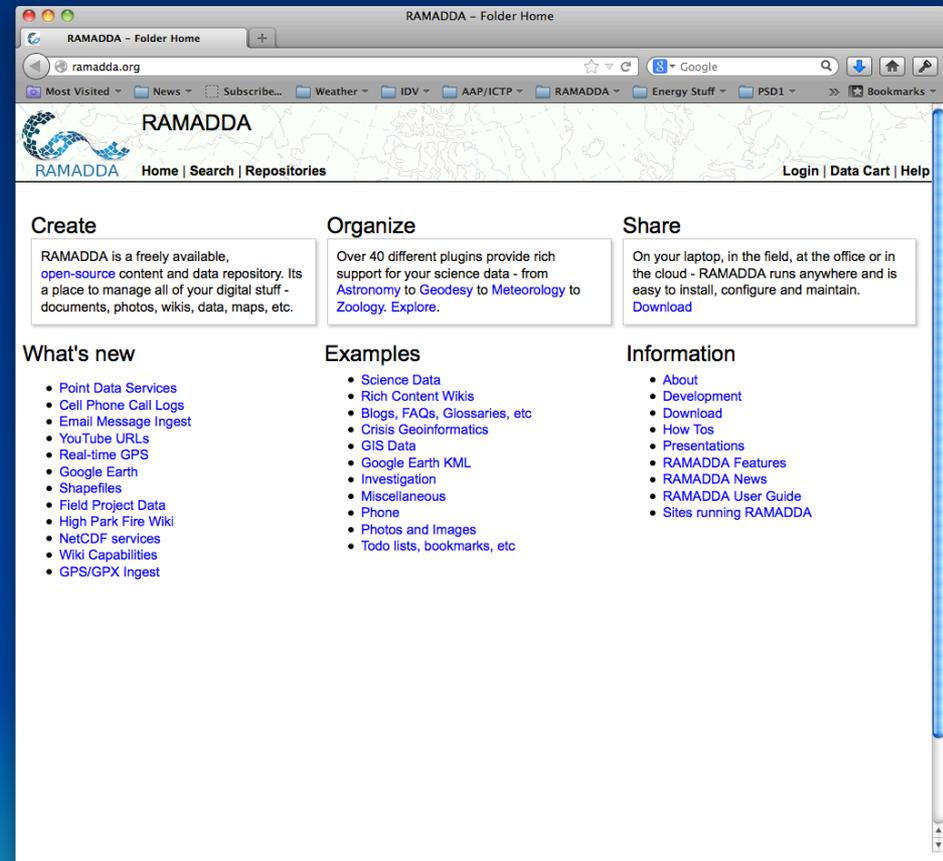
- Investigate the effects of sea ice on arctic amplification (Perlwitz et al. 2013)
 - Sea ice effect limited to lower portion of troposphere
 - Small part of overall arctic warming
- Inform stakeholders on causes of the 2012 Missouri River Basin flooding

More features coming soon

- Additional models and experiments
- Time series
- Animations
- Ensemble analysis
- Access to observational datasets
- Daily Data

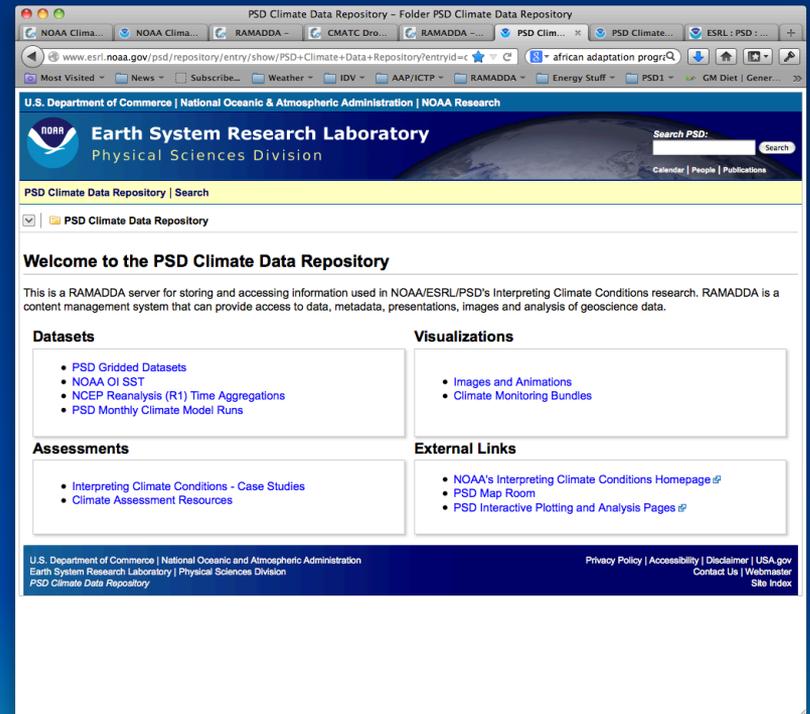
What is RAMADDA?

- Basis for FACTS website
- Repository for Archiving, Managing and Accessing Diverse Data
- Freely available, open source publishing platform and content management system for earth science data
 - Java-based web system
 - Supports query, access and download of data
 - Provides facilities for publishing
 - Plug-in architecture allows others to add new functionality.



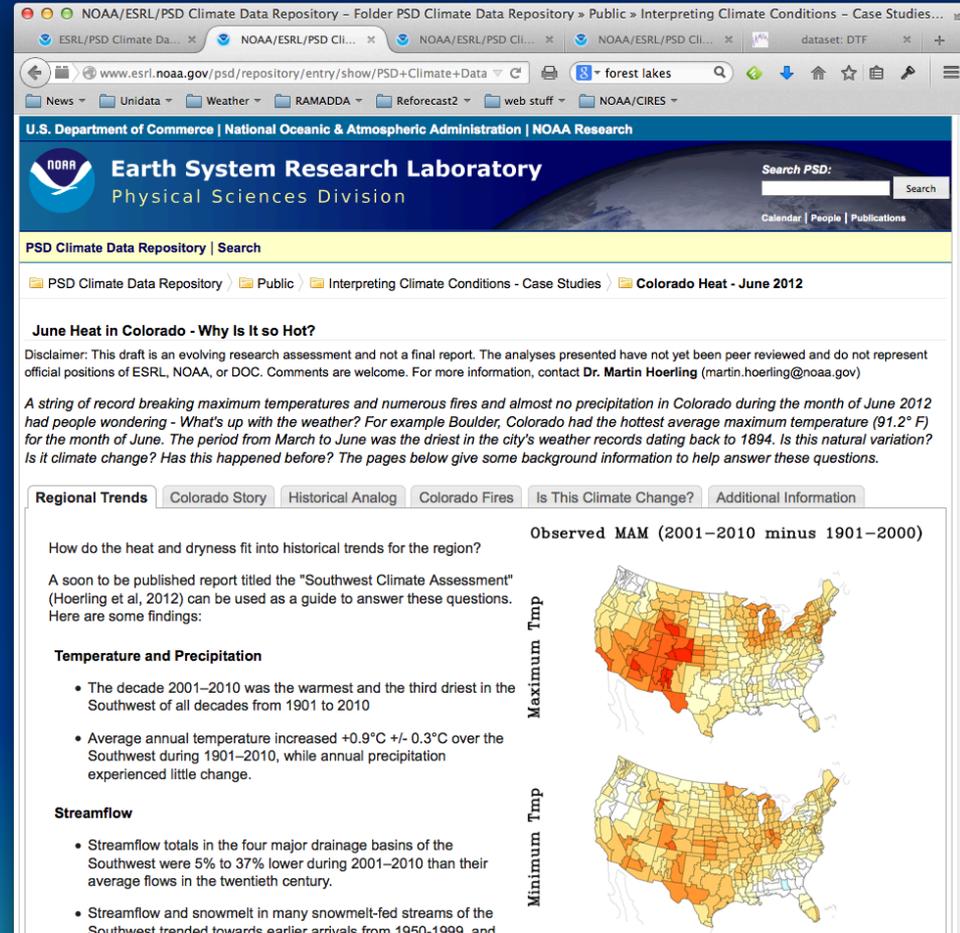
PSD RAMADDA Server

- [NOAA/ESRL/PSD Climate Data Repository](#)
 - Access to climate-related gridded data
 - Home of the FACTS website for climate attribution
 - Publishing platform for PSD climate assessments



Publishing Platform

- The RAMADDA wiki facility can be used to publish climate assessments
 - Allows integration of images, maps, data access
 - Example – [June 2012 Colorado Heat Wave](#)



The screenshot displays a web browser window with the URL www.esrl.noaa.gov/psd/repository/entry/show/PSD+Climate+Data. The page is titled "June Heat in Colorado - Why Is It so Hot?" and is part of the "Colorado Heat - June 2012" series. The NOAA logo and "Earth System Research Laboratory Physical Sciences Division" are visible at the top. The page content includes a disclaimer, a summary of the heat wave, and regional trends. Two maps of the United States are shown, one for Maximum Temperature and one for Minimum Temperature, both highlighting the Southwest region. The maps are labeled "Observed MAM (2001–2010 minus 1901–2000)".

Regional Trends | Colorado Story | Historical Analog | Colorado Fires | Is This Climate Change? | Additional Information

Observed MAM (2001–2010 minus 1901–2000)

How do the heat and dryness fit into historical trends for the region?

A soon to be published report titled the "Southwest Climate Assessment" (Hoerling et al, 2012) can be used as a guide to answer these questions. Here are some findings:

Temperature and Precipitation

- The decade 2001–2010 was the warmest and the third driest in the Southwest of all decades from 1901 to 2010
- Average annual temperature increased $+0.9^{\circ}\text{C} \pm 0.3^{\circ}\text{C}$ over the Southwest during 1901–2010, while annual precipitation experienced little change.

Streamflow

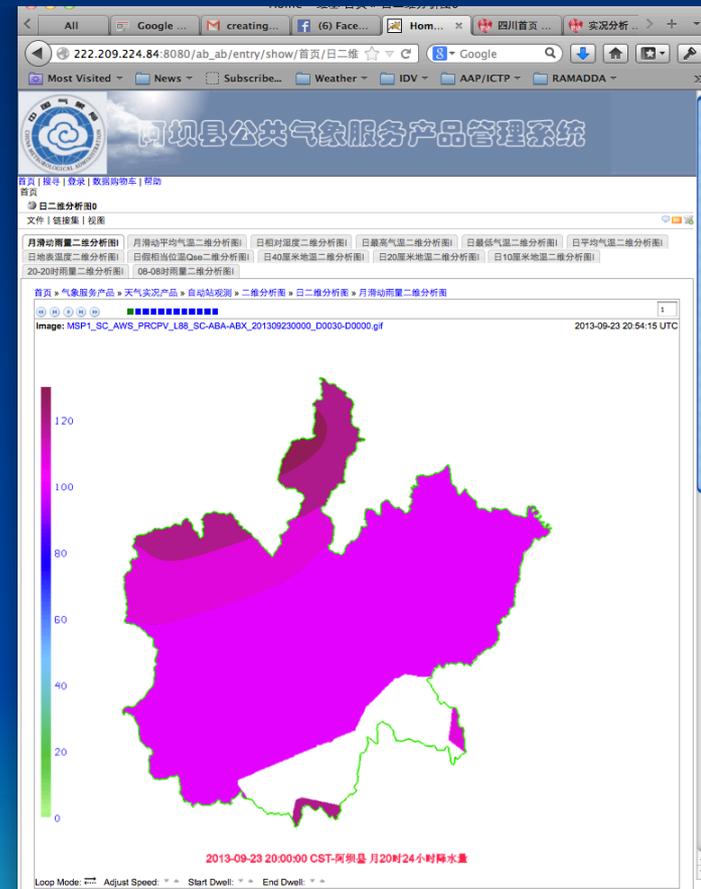
- Streamflow totals in the four major drainage basins of the Southwest were 5% to 37% lower during 2001–2010 than their average flows in the twentieth century.
- Streamflow and snowmelt in many snowmelt-fed streams of the Southwest trended towards earlier arrivals from 1950-1999, and

RAMADDA Features

- Easy to install, runs on most machines, even your laptop
- Supports access to and services for climate data
 - FACTS code available as a plugin
- Publishing facilities allow rapid creation of rich content that includes both the analysis and access to the underlying data without knowing much about web page creation.

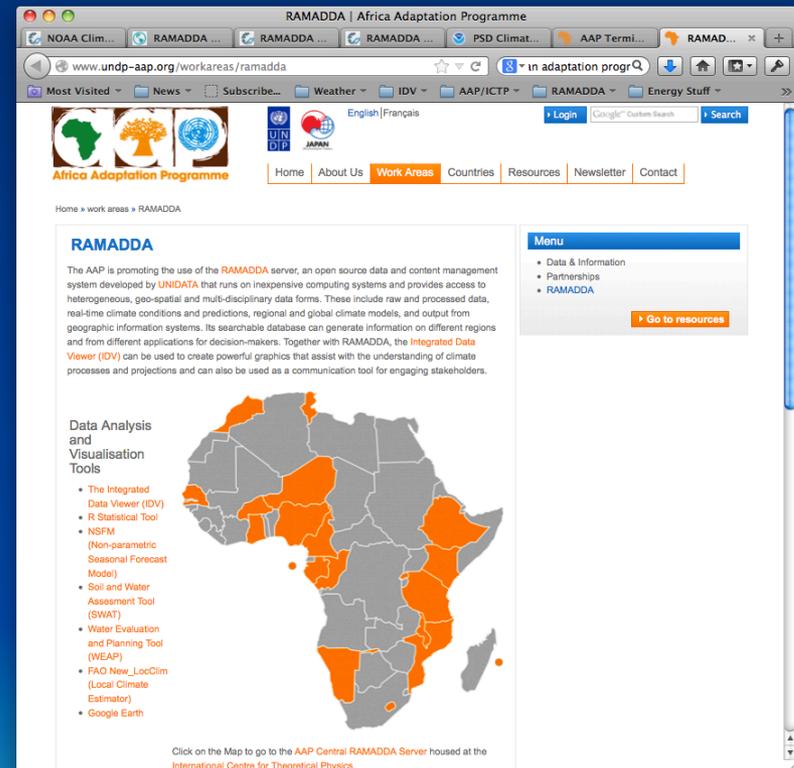
Example RAMADDA Servers

- China Meteorological Administration – Chengdu
 - Store weather information and maps of current weather
 - Maps generated by IDV accessed outside RAMADDA on [public site](#)
 - Uses language translation facility



Example RAMADDA Servers

- African Adaptation Program
 - Designed to assist 20 countries across Africa to incorporate climate change risks and opportunities into their national development processes
 - Used RAMADDA to facilitate access to climate data and share climate related materials.
 - Program concluded in June, 2012, but servers are still running.



Summary

- NOAA's FACTS repository provides freely available climate model experiment output for use in climate assessments
- The underlying RAMADDA framework can be implemented at other sites to provide a similar interface to other model experiments (e.g. CMIP5, CFSR)

More Information

- FACTS website
 - <http://www.esrl.noaa.gov/psd/repository/alias/facts>
- RAMADDA web site with examples:
 - <http://ramadda.org>